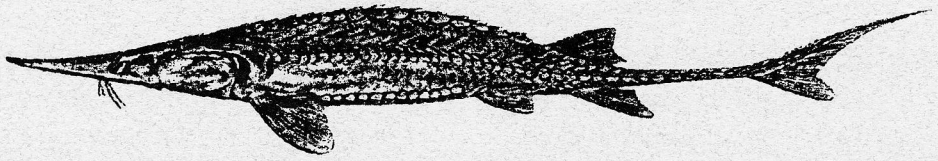


PALLID STURGEON RECOVERY UPDATE

- the latest research and recovery actions -

May, 1993 No. 6 Editors: M. Dryer, S. Werdon

Uncertain Genetics Postpones Stocking

The Pallid Sturgeon Recovery Team has carefully evaluated proposed plans for stocking pallid sturgeon progeny currently held at Blind Pony State Hatchery in Missouri. Due to the long awaited data now available from electrophoretic analyses and after evaluation of morphometric characteristics of the progeny, the Recovery Team has recommended that stocking not occur. Stocking was proposed this spring prior to the fish starting to feed, when costs to hold them would again accumulate.

Dr. Donald Morizott, who is conducting DNA testing on pallids and shovelnose, attempted to identify species-specific polymorphisms for use in evaluating the purity of the Blind Pony sturgeon as recommended by the Recovery Team and MICRA before stocking would occur. Based on this analysis, Dr. Morizott concluded, "While the Blind Pony sturgeon may be pure pallids, I cannot assemble evidence to strongly suggest that. Because the DNA studies are still underway, only morphological criteria thus are currently available to assess potential hybridization with shovelnose sturgeons ... a more extensive and detailed [allozyme] study with more localities and more sampled tissues will be required before conclusive evidence for genetic differentiation between the two species can be assembled." With the samples available, Dr. Morizott could not give solid guidance as to whether release of the Blind Pony fish would have significant positive or negative impacts on natural pallid sturgeon populations. He advises however that "if even a proportion of the fish are hybrids, release certainly would have a negative impact."

Morphological characteristics of the Blind Pony sturgeon progeny leave further doubt as to broodstock purity. As the juvenile sturgeon began developing, some individuals began taking on characteristics of shovelnose sturgeon, others pallid sturgeon, while the majority took on characteristics of both species. Morphometric and meristic characteristics of the Blind Pony sturgeon were compared against pallid sturgeon examined by Bailey and Cross (1954) and against juvenile shovelnose sturgeon reared at Valley City National Fish Hatchery in North Dakota. Morphological characteristics of fish can vary both between and within populations. However, the variations observed, coupled with the electrophoretic analysis, represented the best available information from which to make the decision not to stock.

The definitive word on purity of the progeny will not be known until this fall when the DNA analysis conducted by Dr. Morizott has been completed. The Recovery Team felt that the cost associated with continuing to wait for genetic

INSIDE:

confirmation was too great a risk financially to hold all of the fish until next fall. The Recovery Team recommended that Blind Pony retain up to 200 juveniles for future broodstock should later DNA analysis prove them to be pure pallid sturgeon. Surplus juveniles will be offered for research and outreach, and the remainder sacrificed in a humane manner. This recommendation was supported by U.S. Fish and Wildlife Service's Regional Director in Denver.

Although the full recovery potential of last year's propagation activities could not be met with reintroduction, the propagation effort contributed enormously to recovery of the species. It was shown for the first time that pallid sturgeon can be spawned and reared in hatcheries. Feeding and density trials on the progeny expanded knowledge of rearing requirements. Specimens were provided to aquariums for public viewing. A descriptive key of developing sturgeon is being drawn by Colorado State University's Larval Fish Lab. Ongoing studies are being conducted on tag retention in juvenile sturgeon. Hybrid females were also shown to be fertile when spawned with male pallid sturgeon.

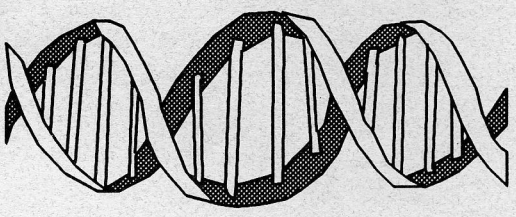
Further studies are planned for some of the juveniles this summer. Four National Fish Hatcheries are working out the details to each receive up to 2500 of the Blind Pony sturgeon for studies on rearing densities, feeds, and temperature tolerances in hatchery ponds.

The Recovery Team is recommending that attempts be made to again spawn pallid sturgeon in 1993. This effort would build upon last year's efforts and refine spawning techniques, develop broodstock, and research rearing requirements. Production targets have been proposed by the Recovery Team and sent to participating hatcheries. If propagation is successful, the progeny would be dedicated for research, outreach, and broodstock. Surplus fish would be disposed of humanely within 60 days of hatching. Stocking is not proposed pending development of a rangewide stocking plan, which is a high priority need identified in the Recovery Plan.

Recovery Activities Underway

Following is a brief summary of current research, management, propagation, and outreach activities. Additional information can be obtained from the identified contact individual(s).

Rangewide Genetics Study - The pallid and shovelnose sturgeon genetics study sponsored by the U.S. Army Corps of Engineers (Corps) and the Service is progressing well. Genetic Analyses, Inc. submitted another quarterly progress report in February. Total DNA from another 51 sturgeon blood samples was extracted and quantified using a spectrophotometer, in addition to the 117 samples already completed. Single copy gene analysis is being utilized because it provides fast, accurate, and unambiguous DNA markers that are transportable and reproducible. Twelve single-copy nuclear genes which are conserved throughout many animal genomes were chosen. Coding regions and the intervening sequences in these genes are known. Regions which code for proteins exhibit little polymorphism, while the intervening sequences are highly polymorphic. Thus, the intervening sequences are useful in genetic studies. Preliminary results of this study will be available in the fall. Contact: Mark Harberg, Corps of Engineers, Omaha, NE 402-221-7270.



DNA

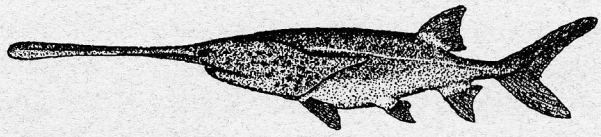
Telemetry Study Below Ft. Peck in Montana - The Montana Department of Fish, Wildlife and Parks (MTDFWP), under contract with the Corps of Engineers, flew the Yellowstone and Missouri Rivers in December 1992 to relocate radio/sonic tagged pallid and shovelnose sturgeon. Ice cover on both rivers was approximately 80 percent, which may have interfered with signal transmission. However, four of the nine pallids tagged last fall were located, along with eight shovelnose sturgeon. The pallids remained within

a two-mile radius above and below their November locations. All shovelnose moved upstream a distance of 0-2 miles. A tenth pallid was tagged in March when divers captured it below Ft. Peck Dam. Mr. Bob Bramblett, graduate student under Dr. Bob White at the Montana Coop. Fishery Research Unit in Bozeman and the MTDFWP, will track the tagged fish this summer. Contact: Anne Tews, Montana Department of Fish, Wildlife and Parks, Fort Benton, MT 406-526-3471 or Bob Bramblett, Montana State University 406-994-3491.

Sturgeon Studies on the Yellowstone & Upper Missouri Rivers in Montana - The MTDFWP, under contract with the U.S. Bureau of Reclamation, studied occurrence of pallid sturgeon in the Yellowstone River upstream of the Intake Diversion Dam, including two main tributaries, the Tongue and Powder Rivers. The Intake Diversion Dam is a lowhead rock dam that diverts water to irrigation canals. Below the Intake Diversion Dam, shovelnose sturgeon were tagged to determine if the dam blocks upstream movements of sturgeon. Fish were also sampled in the Intake canal in October, after water flow to the canal was shut off, to find out if pallid sturgeon entered the system. Findings from this study were published in the report titled "Lower Yellowstone River Pallid Sturgeon Study and Missouri River Pallid Sturgeon Creel Survey" (12/92). The abstract from the study reads:

> From May 18 to August 19, 1992, gill and trammel nets were drifted on the Yellowstone River between Cartersville Diversion Dam and Intake Diversion Dam, the Tongue River [up to the Tongue and Yellowstone (T&Y) Diversion Dam], and the Powder River to locate any pallid sturgeon possibly in the area. No pallid sturgeon were located upstream of Intake during the study but fifteen other fish species were collected, with shovelnose sturgeon being most abundant. Below Intake, sturgeon were also collected from anglers and paddlefish snaggers from May 15 to July 30, 1992. Most shovelnose sturgeon collected below Intake were tagged with orange cinch up tags and released. One pallid sturgeon was snagged on June 26, 1992. Small (less than 454 grams) shovelnose sturgeon were common downstream of Intake and rare upstream of Intake. Shovelnose sturgeon seem able to move over or around Intake Diversion Dam to upstream points. No pallid sturgeon were found in the Intake canal in October, immediately after the seasonal ditch shutdown. Missouri River anglers in the Fred Robinson Bridge area caught and released at least two pallid sturgeon.

MTDFWP also caught 75 blue sucker during this study. For further information: Bill Gardner, MTDFWP, Ft. Benton, MT 406-622-5108.



Paddlefish

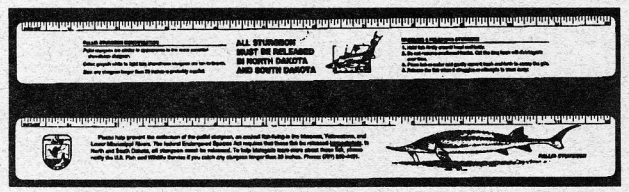
Propagation at Gavins Point National Fish Hatchery - Gavins Point NFH will continue to hold, maintain, and develop techniques for culturing adult pallid sturgeon in 1993. The hatchery would like to acquire additional mature males to spawn with the four potentially ripe females currently in the hatchery. The di-allele mating protocol would be used if possible. The progeny from such a spawning would be used for research and future broodstock. Contact: Herb Bollig, Fish & Wildlife Ser., Yankton, SD 605-665-3352.

Research Planned on Pallid Sturgeon Eggs and Larvae - If propagation activities at either Gavins Point NFH or Blind Pony SFH are successful, Fish and Wildlife Service research facilities propose studies on rearing requirements, behavior, and effects of environmental contaminants on hatching and developing fry. Matt Bernard, Hatchery Manager at Valley City NFH in Valley City, ND, will again work through the Bozeman FTC in Bozeman, MT, to research rearing requirements of pallid sturgeon fry. Dr. Steve Hamilton at the Service's National Fisheries Contaminant Research Center in Yankton, SD, will research effects of different concentrations of selenium, lead, arsenic, and mercury on pallid sturgeon eggs and developing fry. Boyd Kynard of the Service's Conte Anadromous Fishery Research Center in Turners Falls, MA, will observe and record response of pallid sturgeon embryos to elements such as light, flow, and substrate preference. Contact: Matt Bernard, 701-845-3466; Steve Hamilton, 605-665-9217; or Boyd Kynard, 413-863-8993 for additional information on their studies.

Sturgeon Studies on the Missouri River in ND - The ND Game and Fish Department received funding through Section 6 of the Endangered Species Act to continue studies on sturgeon habitat characteristics in the Missouri River. Study efforts this year will move to upstream of Lake Sakakawea. Results of last year's study were reported in the December issue of Pallid Sturgeon Recovery Update. Contact: Scott Elstad, ND Game and Fish Department, Riverdale, ND 701-654-7475.

Outreach in North Dakota - Ecological Services and Fish and Wildlife Assistance in Bismarck presented a booth on rare, endangered, and threatened species of the Missouri River at sport and recreation shows in Bismarck (February 4-6, 1993) and Williston (March 19-21, 1993). Pallid sturgeon were a prominent feature of the display, along with paddlefish, blue suckers, and sicklefin and sturgeon chub. Attendance was approximately 15,000 in Bismarck and 5,000 in Williston. Contact: Steve Krentz, Fish and Wildlife Service, Bismarck, ND 701-250-4419.

Pallid Sturgeon Informational Rulers Being Distributed - Ecological Services in Bismarck, North Dakota, and Pierre, South Dakota, have begun distributing free flexible plastic rulers to bait/fishing license vendors in both states. The 12-inch rulers, suitable for the bottom of a tackle box, advise anglers that pallid sturgeon are endangered and must be released. Rulers will also be distributed by creel clerks stationed at popular fishing sites and access areas on the Missouri River in North Dakota. A telephone number is given for anglers to report catch records of pallid sturgeon. Contact: Mark Dryer, USFWS, Bismarck 701-250-4491.



"Ecosystems have no useless parts, and we are foolish to think they do. Species, including endangered ones, are stabilizers. What the hump is to the humpback chub, endangered species are to humans."

Holmes Rolston III
(Battle Against Extinction, 1991)

Tagging and Morphological Characteristics Study Continues - As reported in December, biologists from Fish and Wildlife Assistance and Ecological Services in Bismarck traveled to Gavins Point National Fish Hatchery in December to obtain morphometric and meristic data from juvenile sturgeon hybrids and juvenile pallids, and to tag juvenile hybrids with various external and internal tags. This spring, tag retention and effects of tagging will be observed when tagged and untagged sturgeon are examined. Morphologic characteristics of the progeny will again be obtained. Contact: Mark Dryer (701-250-4491) or Steve Krentz, Fish and Wildlife Service, Bismarck, ND 701-250-4419.

Old River Control Study Continues - The Inland Fish Division of the Louisiana Department of Wildlife and Fisheries (LADWF) has been sampling near the Old River Control Structure twice a month. Flows are currently running around 1,000,000 cfs and sampling conditions are difficult. No pallids have been caught since October and even shovelnose catches are rare. LADWF also spawned some paddlefish in March and is currently intensively rearing 100,000 1-inch fingerlings at McNenny State Fish Hatchery. Contact: Bobby Reed, Louisiana Department of Wildlife and Fisheries, Lake Charles, LA 318-491-2577.

Commercial Harvest of Bowfin Eggs Prohibited in LA - In 1992, LADWF prohibited the taking of bowfin or bowfin roe during the months of December, January, and February. As a result, all caviar fishing operations in Louisiana water

during winter and early spring were eliminated. Bowfin ovaries are very similar in size to those of small sturgeon. Contact: Bennie Fontenot, Louisiana Department of Wildlife and Fisheries, 504-765-2330.

Sturgeon Movement Study in Louisiana - The Cooperative Fish and Wildlife Research Unit at Louisiana State University is initiating a 3-year study of pallid sturgeon movement patterns and habitat preferences on the Mississippi, Red, and Atchafalaya Rivers. Contact: C. Fred Bryan, Louisiana Coop Fish and Wildlife Research Unit, Baton Rouge, LA 504-388-4184.

Morphological Development of Sturgeon Larvae Progress Report - Dr. Darrel Snyder of the Larval Fish Lab at CSU in Ft. Collins, CO, provided a second quarterly progress report. He has examined and prepared detailed drawings of protolarvae larvae through 14mm TL (about 6 days post-hatching). From these earliest larvae, he has not yet found any consistent diagnostically useful differences in myomere count, morphological form and structure, developmental state relative to size, or pigmentation to differentiate the pallid, shovelnose, and hybrid sturgeon he is examining. However, detailed morphometrics remain to be analyzed. During the next quarter, he will finish the drawings and should complete comparative examination of the remaining larval stages through 50mm TL. Contact: Darrel Snyder, Larval Fish Laboratory, CSU, Ft. Collins, CO 303-491-5295.

Catch Record Database Updated - Ecological Services in Bismarck updated the pallid sturgeon rangewide catch record database, which is now current through March 1993. The report includes records of capture for more than 500 pallid sturgeon from as early as 1920. Only scant information is available for the earlier records, most coming from sport and commercial fishermen. Recent catch records by fishery researchers and managers provide information on morphological characteristics of the individual fish and habitat characteristics at capture locations. Contact: Mark Dryer, Ecological Services, Bismarck 701-250-4491.

Pallid Sturgeon Handling Guidelines and Protocol Revised - The pallid sturgeon handling guidelines and protocol previously dated September 1991 have been revised to reflect new information. The new guidelines dated January 1993 describe protocol and recommendations for capture gear and methods, internal and external radio or sonic tags, identification tags, transport, short- and long-term holding facilities and reporting of catch records. Included with the guidelines is a sample form for recording catch records. Any study activities that might harm or disturb pallid sturgeon requires an endangered species permit. All permittees should have a copy of the revised guidelines dated January 1993. If not, or if you would like a copy of the guidelines contact: Mark Dryer, USFWS, 1500 Capitol Ave., Bismarck, ND 701-250-4491.

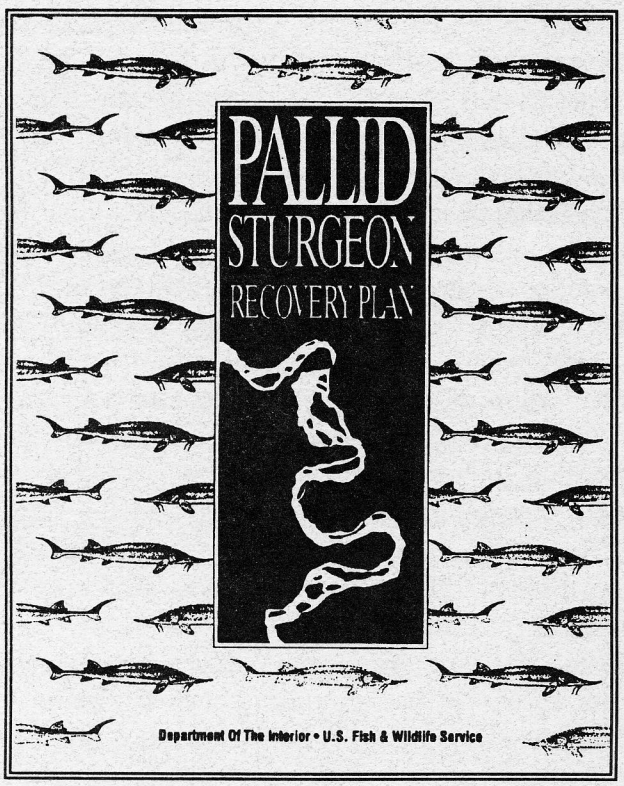
Russian Sturgeon Symposium

The European Aquaculture Society, Rosrybhoz, Rybotex Joint-Stock, Inc., and the All-Russian Research Institute of Fisheries and Oceanography (VNIRO) are hosting the "Second International Symposium on the Sturgeon" in Moscow on September 6-11, 1993. The symposium will promote an exchange of information relating to the life history of sturgeon, their farming, and conservation. Topics include: Biology (systematics, ecology, physiology, biochemistry, genetics, diseases); Management of Natural Populations (population dynamics, pollution effect, enhancement of natural resources, restoration of stocks); and Aquaculture (creation of brood stocks, feeding, disease treatment, farming in ponds, cages and tanks, application of flow-through and recirculating systems). The official languages for the symposium are Russian and English. Papers have already been received from across the United States. Dr. Kent Keenlyne, (U.S. Fish and Wildlife Service, Pierre, SD) technical consultant to the Pallid Sturgeon Recovery Team, had his abstract on pallid sturgeon accepted and hopes to attend. The symposium sponsors are also interested in including papers on paddlefish. For more information contact: Dr. A.D. Gershanovich, All-Russian Research Institute of Fisheries and

Oceanography (VNIRO) 17, V. Krasnoselskaya, Moscow, 107140, Russia or FAX (095)264-9187.

Final Recovery Plan Being Reviewed

The Pallid Sturgeon Recovery Plan was completed by the Recovery Team in March and should be available for distribution early this summer. The plan is currently under review in the Service's Regional Office (Region 6) for approval by the Regional Director in Denver. From Denver the Plan will go to the Government Printing Office in Washington, D.C. for printing. Copies of the Plan will be sent to everyone who submitted written comments or drafts. Additional copies can be obtained by completing the Reader Survey form in this issue of the UPDATE or by contacting Mark Dryer, Recovery Team Leader, USFWS, 1500 Capitol Ave., Bismarck, ND 701-250-4491.



Do Acipenserid Fish Require Vitamin C ?

By: Konrad Dabrowski, Ohio State University

Increasing interest in sturgeon and paddlefish culture and propagation has stimulated studies of their nutrient requirements. Vitamins are particularly worth attention since they are critical factors in fish performance and health. Two experiments were conducted on paddlefish and white sturgeon juveniles which were fed experimental diets with graded levels of ascorbate (Vitamin C) supplementation. In the first experiment, juvenile paddlefish (0.45 ± 0.2 g) were fed an ascorbic acid-free diet or an ascorbic acid supplemented (120 mg/kg) diet for 70 days. The two diets resulted in significant differences in individual fish weights, with the supplemented diet fish weighing more. However, there were no significant differences in ascorbic acid concentrations in paddlefish livers. In the second experiment, juvenile white sturgeon were fed five diets with graded levels of ascorbic acid (0, 30, 110, 220, and 440 mg/kg) for 80 days. There was no consistent association between the individual weights of fish and ascorbate supplementation. Previous assays of gulonolactone oxidase activity have revealed high activity of this enzyme in sturgeon kidney. This is the first record of ascorbate synthesizing capacity in *Chondrostei* fish and suggests that in contrast to *Teleostei* fish, sturgeon do not require a supplement of Vitamin C in their diets.

Sensitivity of Pallid Sturgeon x Shovelnose Sturgeon Hybrids to Fishery Chemicals

By: Doug Aloisi, Neosho NFH

Pallid sturgeon have become extremely rare in the Missouri River and are now listed on the Endangered Species List. As the effort to restore these fish throughout their historical range intensifies, fish culture may be included as a tool to help restore the species. This species was cultured for the first time at Blind Pony State Fish Hatchery, Sweet Springs, Missouri. However, little is known about its optimum temperature range, sensitivity to various chemical treatments, and dietary needs. Through the efforts of the Missouri Department of Conservation (MDC), a

pallid sturgeon x shovelnose sturgeon hybrid female was successfully spawned with a pure pallid sturgeon male. Fry (n = 250) from this cross were transferred to Neosho National Fish Hatchery on April 12, 1992. They had been fed a diet of BioKyowa and were approximately 0.5 inches in length. The sturgeon were tempered to the station water supply and placed in a 120 gallon horse watering trough with an inflow of 3 gpm. The fry were placed on a dry trout starter diet obtained from Murray feeds (Murray Trout and Salmon Starter, Murray Elevators, Murray, Utah). After a few weeks, some pinheads (non-feeding fish) were removed (approx. 10%) and the remainder appeared to be feeding well on the artificial diet, although natural food was available from the existing pond water supply.

When fish length averaged approximately 2.2 inches, they were exposed to a variety of fishery chemicals that they may come in contact with during a production cycle. Ten fish samples were placed in a 10 gallon trough with bubblers to maintain adequate water quality during the 24-hour bioassay. The results of the treatments and the effects on their survival are listed below.

Chemical	Treatment	Survival
Copper Sulfate	1.5 mg/l - 24 hours Total Water Hardness 150 mg/l	70%
Cloramine T	12 mg/l and 2.5 % salt 1 hour static trt	91%
Formalin	1/6000 - 1.5 hour static trt at 75°F	30%

The hybrids are hardy fish, and the only chemical they appeared particularly sensitive to was the external parasitide, formalin. Possibly, the sturgeon could be weaned onto a formalin treatment with increasingly stronger dosages. The hybrids grew and fed well, and no particular disease outbreaks were noted. Culture of the pure pallid sturgeon, as proven by the MDC, appears to be a viable option as a management tool for the recovery of the species.

Mailing List Changes

Due to budget cuts and rising printing costs, the editors must pare down the UPDATE mailing list and cut back to two issues per year. Currently, 260 individuals and agencies receive copies three times a year (Table 2). Please complete the enclosed form and check the appropriate box if you wish to remain on the mailing list for the UPDATE and/or receive a copy of the "Pallid Sturgeon Recovery Plan." We will continue to mail the UPDATE free-of-charge to those submitting the form before September 1993. Also, if multiple copies are being sent to your office and it is feasible for a single copy to be routed to several individuals, please indicate so on the attached form. The UPDATE will now be printed in May and November.

Table 2. Circulation Summary for May 1993 Pallid Sturgeon Recovery Update.

Geographic Destination	Affiliation of Recipient										
	SA	FA	NA	UC	IG	CU	PE	PG	EG	PC	TOTAL
Arkansas	4					1		1			6
California				1		1					2
Colorado		12	1	2		1					16
District of Columbia			1						1		2
Florida		5			1	1					7
Georgia		5									5
Idaho						1					1
Illinois	2	5					1	1			9
Iowa	2			1	1	1		1			6
Kansas	6	1			1	1					9
Kentucky	2						1	1			4
Louisiana	11	8			1	3		1			24
Massachusetts		1									1
Minnesota		8		2						1	11
Mississippi	2	5				1		1			9
Missouri	24	9			3	1		1			38
Montana	10	7	2	6	3	2	1		1	3	35
Nebraska	7	8		4	2	1		1			23
North Dakota	5	4		3	1		2	1	4		20
Ohio						2					2
Oklahoma	1										1
Oregon		1									1
South Carolina		1									1
South Dakota	5	4			1	3			1	1	15
Tennessee	2	3				1		1			7
Texas	1					1	1				3
West Virginia		1									1
Wisconsin		1									1
TOTAL	84	89	4	19	14	22	6	10	7	5	260

State Agency (SA), Federal Agency (FA), Native American Group (NA), Utility Company (UC), Interagency Group (IG), College/University (CU), Private Enterprise (PE), Professional Group (PG), Environmental Group (EG), Private Citizen (PC)

MICRA Paddlefish/Sturgeon Subcommittee Meeting

The MICRA Paddlefish/Sturgeon Subcommittee held its second meeting February 10-12 in Columbia, Missouri. The meeting was held to develop a strategic plan for interjurisdictional management of paddlefish and sturgeon within the basin. Chairman Kim Graham, Missouri Department of Conservation (314-882-9880) can be contacted for additional information.

Paddlefish Video Production Underway

The Service and State game and fish agencies from South Dakota, Missouri, Arkansas, Montana, Louisiana, and North Dakota are collaborating on a paddlefish video for broadcast on public television and for use as an educational tool. Objectives of the project are to document paddlefish life history, including reproduction, migration, and habitat, and also biological research on the species. Benefits from the video will include generating a greater public awareness of the plight of the paddlefish, problems with poaching and habitat loss, the species role in the ecosystem, and the economic impacts of their utilization. Video footage of field acquisition of paddlefish and on-camera interviews is being obtained on location in the participating states. Scripting of the final drafts and a reference video should be complete by October 1993. A similar video on pallid sturgeon would be a valuable recovery tool in the public information and education arena and was identified as a priority recovery task in the Recovery Plan.

Pallid Sturgeon Recovery Team Members

Mark Dryer (Leader), USFWS, Ecological Services Bismarck, ND

Al Sandvol, USFWS, Fish and Wildlife Assistance Office, Bismarck, ND

Mark Harberg, U.S. Army Corps of Engineers, Omaha, NE

Pat Clancey, Montana Department of Fish, Wildlife and Parks, Ft. Peck, MT

James Riis, South Dakota Game, Fish and Parks Department, Pierre, SD

Kim Graham, Missouri Department of Conservation Columbia, MO

Bobby Reed, Louisiana Department of Wildlife and Fisheries, Lake Charles, LA

Dr. Frank Chapman, University of Florida, Gainesville, FL

Dr. Kent Keenlyne (Consultant), USFWS, Fish and Wildlife Assistance Office, Pierre, SD

Share what you are doing for sturgeon conservation on the Missouri and Mississippi Rivers with other sturgeon researchers. Submissions of sturgeon articles and associated materials are welcome. Please send a hardcopy and/or disk copy (WP 5.1) to Mark Dryer at the U.S. Fish and Wildlife Service, 1500 Capitol Ave., Bismarck, ND 58501 (701-250-4491).